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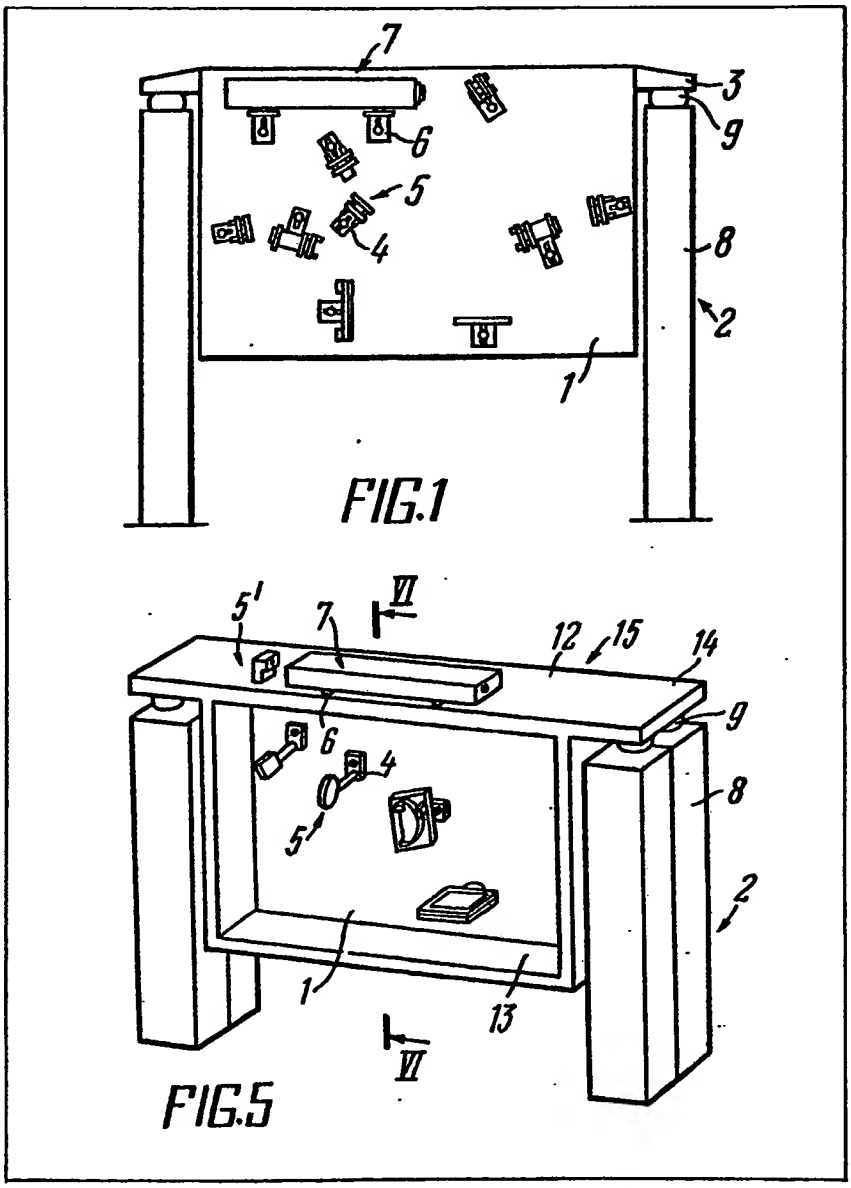
(54) Optical bench

(57) An optical bench comprising a working plate (1) mounted on a vibration-proof base (2) in a substantially vertical plane with the aid of connecting members (3) arranged in the upper part of the working plate (1). The working plate (1) carries holders (4) for optical elements (5) making up an optical circuit, and a light source (7). Two of the several embodiments described are shown in figs. 1 and 5.



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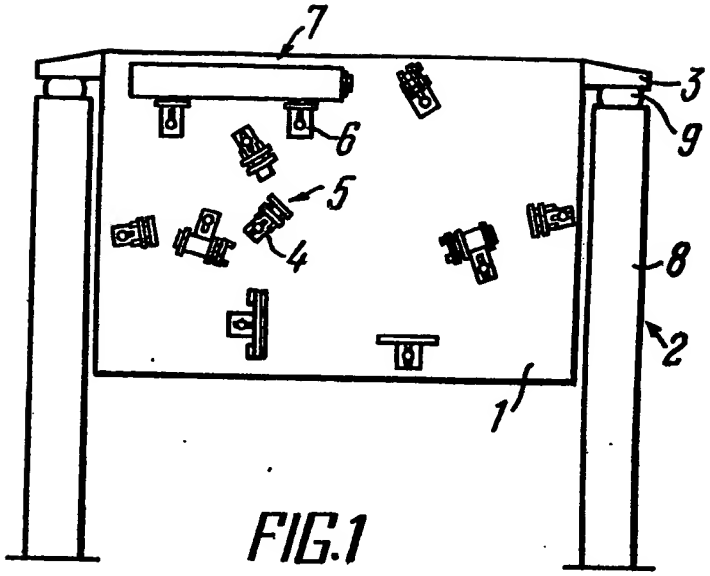

FIG.1

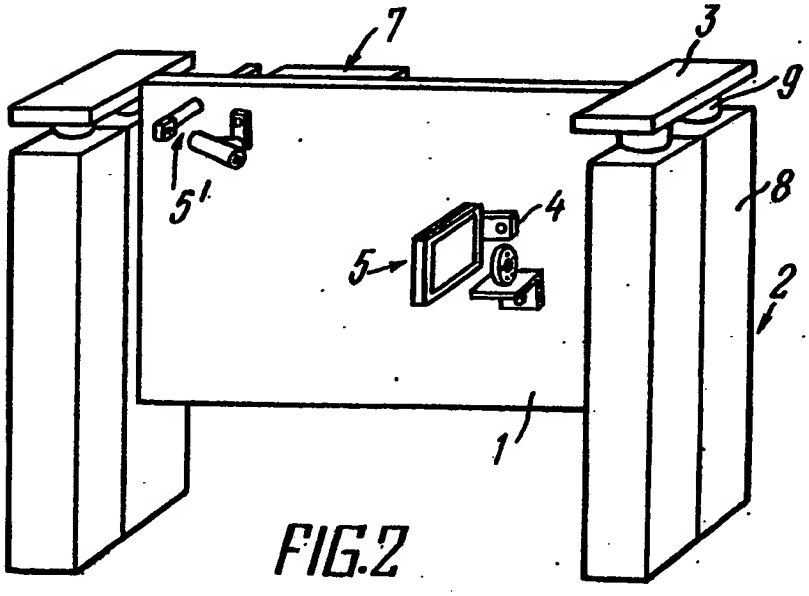

FIG.2

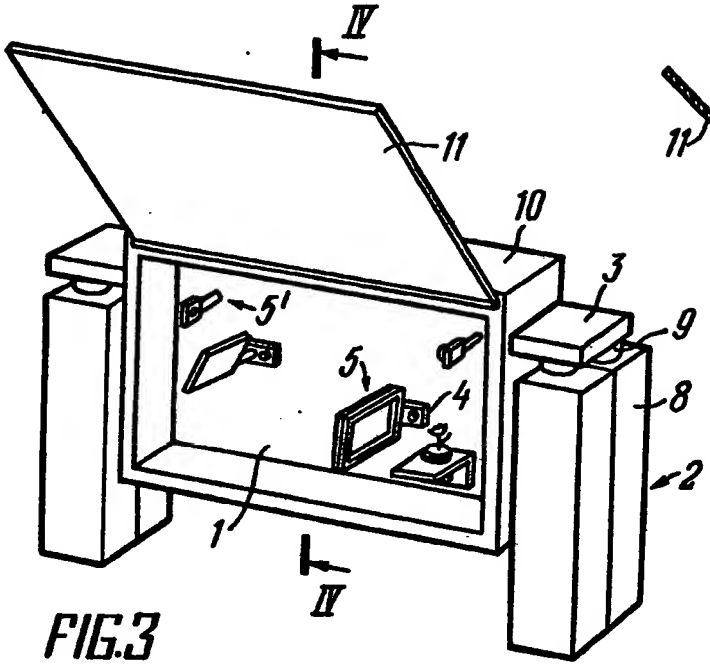

FIG.3

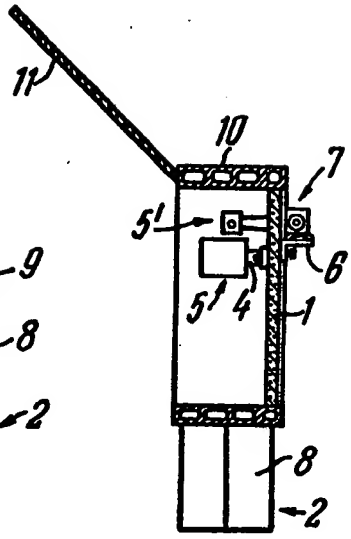

FIG.4

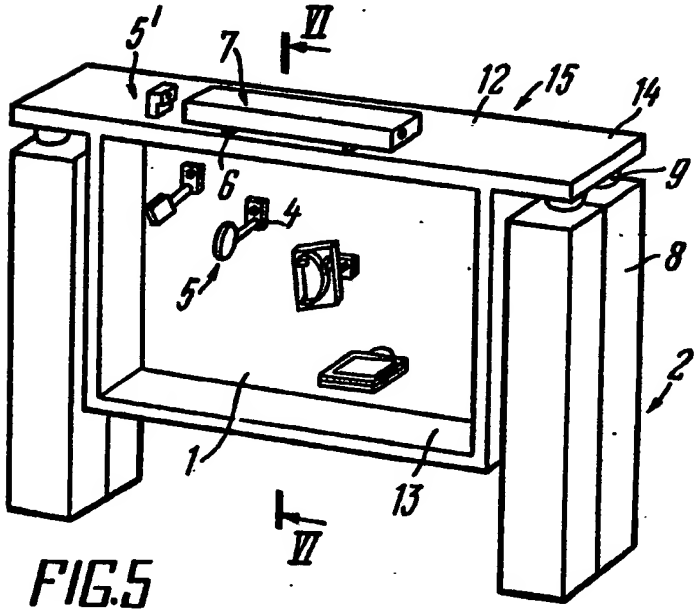

FIG.5

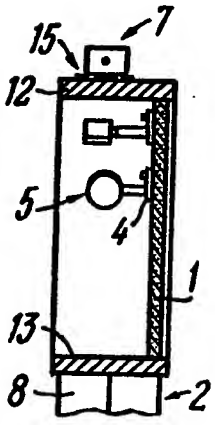

FIG.6

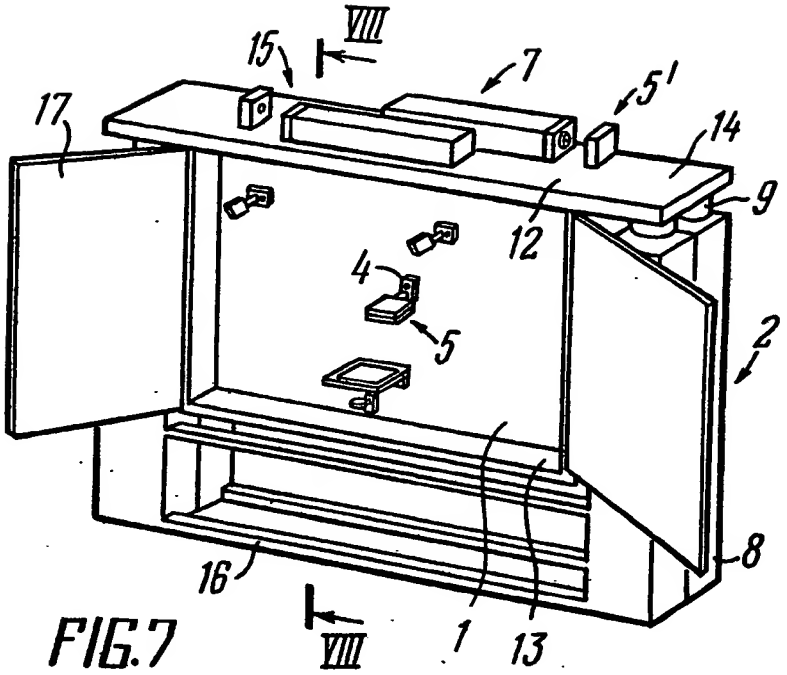
VIII
15
7
5'
17
14
9
12
4
5
2
8
16
VIII
1
13

FIG.7

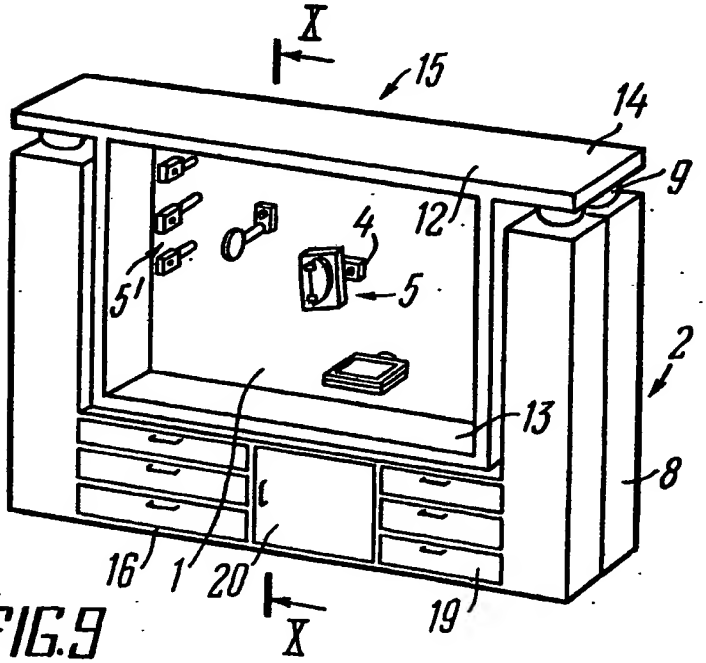
X
15
14
9
12
4
5'
5
2
13
8
16
1
20
X
19

FIG.9

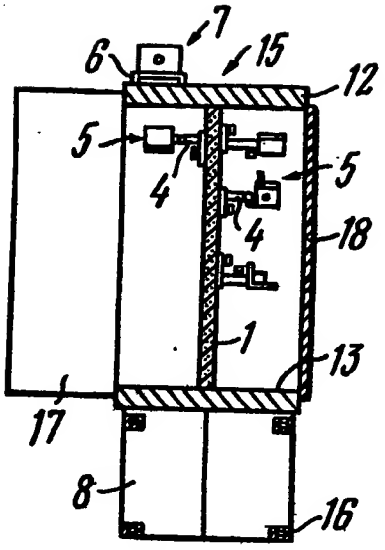

FIG.8

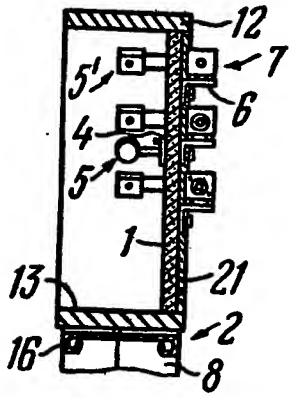

FIG.10

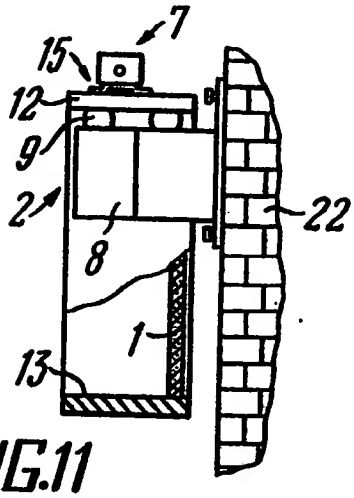

FIG.11

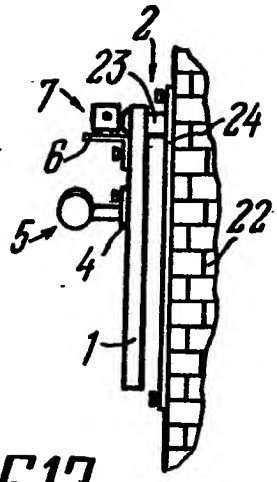

FIG.12

SPECIFICATION

Device for conduction optical research

The present invention relates to optical instrumentation and is more particularly concerned with devices for conducting optical research.

The invention is applicable to optical and holographic research. It can also be used to produce multipurpose holographic equipment.

Stringent requirements are imposed on equipment for optical research involving the recording of interference patterns. They are primarily concerned with the stability of operation and immunity from the effects of vibration, air flows, temperature fluctuations, and acoustic noise.

There is known a device for conducting optical research, which comprises a massive working plate of steel with threaded holes for securing holders of optical elements making up an optical circuit, a light source, and a vibration-proof base composed of several chambers and intended to protect the working plate from vibration.

The working plate is arranged in the horizontal plane. This affects the operating stability of the optical system, because the working plate is subject to flexural strains. The vibration-proof base does not eliminate vibration completely. Vibration forces are normal to the working plate, being applied to it in the direction where the plate exhibits the least rigidity.

If several laser light sources are used, they can only be placed on the working plate. As a result, the area intended for the optical circuit is substantially reduced. The arrangement of the light sources on the working plate affects the performance of the optical system which is exposed to the heat emitted by the light sources.

During optical research, it is often necessary to protect the optical system from the effects of air flows, temperature fluctuations and acoustic noise. This is done by using protective boxes or caps arranged on the working plate, which present serious problems in laying out and operating the optical circuit.

When using a device with a horizontal working plate, the experimenter has to bend over the plate, which rapidly causes fatigue, especially in operating complicated optical circuits.

There is further known a device for conducting optical research, which comprises a working plate mounted on a vibration-proof base with the aid of connecting members, holders of elements making up an optical circuit mounted on the working plate, and at least one light source connected to the working plate.

The working plate extends in the horizontal direction. The connecting members are arranged on the lower side of the working plate.

The horizontal arrangement of the working plate affects the performance of the optical circuit because of flexural strains on the working plate. The vibration-proof base does not fully eliminate vibration which acts on the working plate at a right angle, i.e., in the direction where the rigidity of the working plate is the lowest.

If several laser light sources are used, only one of them can be arranged on a special platform under the working plate. All the other light sources have to be mounted on the working plate, which considerably reduces the area intended for the elements of the optical circuit. The arrangement of the light sources on or under the working plate affects the performance of the optical circuit, because the optical system and the working plate are exposed to the heat liberated by the light sources.

The optical system can be protected from the effects of air flows, temperature fluctuations and acoustic noise by boxes or caps mounted on the working plate. Such boxes or caps are disadvantageous, however, in that they present difficulties in operating the optical circuit.

When using a device with a horizontal working plate, the experimenter has to work in a bent position, which rapidly leads to fatigue, especially in operating a complicated optical circuit.

The invention provides a device for optical research comprising a working plate mounted on a vibration-proof base in a substantially vertical plane with the aid of connecting members arranged in the upper part of the working plate, holders of elements making up an optical circuit, mounted on the working plate, and at least one light source connected to the working plate.

In order to enhance the rigidity of the working plates, improve the operating stability of the optical circuit, reduce the weight of the working plate, and protect the optical circuit mounted on the working plate from the effects of air flows and acoustic noise in the plane of the working plate, the latter is preferably mounted in a frame arranged on the perimeter of the working plate.

In order to simplify the device for optical research and enhance its rigidity, the upper part of the frame and connecting members should be made as a single bar.

In order to protect the optical circuit from the effects of air flows, temperature fluctuations and acoustic noise, the frame is preferably provided with at least one movable screen.

In order to insulate the optical elements making up the optical circuit from the heat liberated by the light sources, at least one of the light sources should be placed on the upper part of the frame.

In order to expand the functional potentialities of the device for optical research and provide for simultaneous operation of two optical circuits, the holders of the optical elements are preferably arranged on the opposite side of the working plate.

It is thus possible to enhance the operating stability of the optical circuit by eliminating flexure strain on the working plate. It makes possible to use several light sources without reducing the area intended for the optical circuit elements. The optical circuit can be insulated from the heat liberated by the light sources. The optical circuit can be protected from the effects of air flows,

temperature fluctuations and acoustic noise, which is done without deterioration of the working conditions. The device of this invention is easier to operate than conventional devices serving the same purpose.

The invention will be further described, by way of example only, with reference to the accompanying drawings, wherein:

Fig. 1 is a front view of a device for conducting optical research in accordance with the invention;

Fig. 2 is an axonometric view of an alternative embodiment of the device in accordance with the invention;

Fig. 3 is an axonometric view of another alternative embodiment of the device in accordance with the invention;

Fig. 4 is a section taken on line IV—IV in Fig. 3;

Fig. 5 is an axonometric view of a still another alternative embodiment of the device in accordance with the invention;

Fig. 6 is a section taken on line VI—VI in Fig. 5;

Fig. 7 is an axonometric view of a yet another alternative embodiment of the device in accordance with the invention;

Fig. 8 is a section taken on line VIII—VIII in Fig. 7;

Fig. 9 is an axonometric view of one more alternative embodiment of the device in accordance with the invention;

Fig. 10 is a section taken on line X—X in Fig. 9;

Fig. 11 is a cut-away side view of the device of Fig. 5;

Fig. 12 is a side view of an alternative embodiment of the device in accordance with the invention.

Referring to the attached drawings, a device for conducting optical research in accordance with the invention comprises a working plate 1 (Fig. 1) vertically mounted on a vibration-proof base 2 with the aid of connecting members 3 arranged in the upper part of the working plate 1. The connecting members 3 are brackets mounted on the working plate 1 in any known manner, for example, by means of threaded joints. Each of the connecting members 3 has a bearing face which rests on the vibration-proof base 2. The working plate 1 carries holders 4 of optical elements 5 which make up an optical circuit, and holders 6 in which a laser light source 7 is installed. In this embodiment, the holders 4 of optical elements 5 and the light source 7 are mounted on one side of the working plate 1.

The vibration-proof base 2 contains a support 8 and an elastic member 9.

The working plate 1 is arranged in the vertical plane. A deviation of more than $\pm 10°$ from the vertical must be avoided, because it may lead to a flexural strain due to a deflection of the plate 1 and to the vertical component of vibration acting on the base 2.

For rapid damping of vibration of the working plate 1 (Fig. 2), which may occur when the plate 1 is touched or acted upon by impulses of force transmitted through the base 2, it is advisable that the base 2 incorporate four supports 8, two on each side of the working plate 1. It is obvious that increasing the number of supports 8 and elastic members 9 would proportionately reduce the pressure on them.

In the embodiment of Fig. 2, the holders 4 of the optical elements 5 and the light source 7 are mounted on the opposite sides of the working plate 1. The radiation of the light source 7 is transmitted by means of a periscopic device 5′ incorporated in the optical circuit.

In order to minimize the weight of the working plate 1, one may use an aluminium plate 20 to 30 mm thick, but in this case the plate 1 is enclosed in a rigid frame 10 (Fig. 3).

In the embodiment of Fig. 3, the holders 4 (Fig. 4) of the optical elements 5 and the light source 7 are mounted on the opposite sides of the working plate 1.

A movable screen 11 (Figs. 3 and 4) is mounted on the frame 10. The function of the screen 11 is to protect the optical elements 5 from the effects of air flows, temperature fluctuations and acoustic noise.

Fig. 5 shows a simplified embodiment of the device according to the invention, in which an upper part 12 of a frame 13 and connecting members 14 are a single whole and make up a bar 15.

In the latter embodiment, the light source 7 is mounted on the upper part 12 of the frame 13. The holders 4 of the optical elements 5 are mounted on one side of the working plate 1, as is shown in Fig. 6.

In order to facilitate handling of the device according to the invention and enhance its rigidity, the supports 8 (Fig. 7) arranged on the sides of the working plate 1 have their lower ends rigidly interconnected by braces 16.

In this embodiment, there are two light sources 7 which are mounted on the upper part 12 of the frame 13. The holders 4 of the optical elements 5 are mounted on the opposite sides of the working plate 1, as is shown in Fig. 8.

In the embodiment of Fig. 7, screens 17 and 18 (Fig. 8) are movably mounted on the frame 13 and serve to protect the optical circuits from the effects of air flows, temperature fluctuations and acoustic noise.

The space between the supports 8 (Fig. 9) of the vibration-proof base 1 under the working plate 1 can be used to store optical elements and all kinds of auxiliary instruments and attachments. These are stored in drawers 19 and 20.

In order to insulate the optical circuit from the heat liberated by the light sources 7, the holders 4 of the optical elements 5 and the light sources 7 are mounted on the opposite sides of the working plate 1, as is shown in Fig. 10.

For better thermal insulation of the optical circuit, the working plate 1 has a coating of a heat insulation material, such as cork or asbestos, on the side where the light sources 7 are mounted.

The device of Fig. 5 can be attached to a wall. Such simple wall-type holographic devices can serve as study aids. They can also be used in

households for three-dimensional displays of artistic objects. In this case the supports 8 are mounted on a wall 2, as is shown in Fig. 11.

In the embodiment of Fig. 12, the working plate 1 is vertically mounted on the vibration-proof base 2 with the aid of connecting members 23 arranged in the upper part of the working plate 1.

In this embodiment, the connecting members 23 also serve as elastic members. They are mounted on a frame 24 attached to the wall 22.

The device for conducting optical research in accordance with the invention functions as follows.

The vertical arrangement of the working plate 1 (Fig. 1) ensures superior protection from vibration. It is seen from Fig. 1 that vibration can be transmitted from the supports 8 to the working plate 1 in three directions, namely, vertically, horizontally in the plane of the working plate 1, and horizontally at a perpendicular to the plane of the working plate 1. These directions are designated as z, x and y, respectively.

Vibration displays a maximum amplitude in the z direction, but it cannot lead to a considerable deformation of the plate 1, because the rigidity of the plate 1 is very high in the z direction. The amplitudes of vibration in the x and y directions are by a whole order of magnitude lower than the amplitude of vibration in the z direction. What is said about vibration in the z direction equally applies to vibration in the x direction. Vibration in the y direction is at a right angle to the working plate 1 and may cause natural vibrations of the plate 1. However, vibration in the y direction is taken care of by the elastic members 9. The damping of this vibration is complete, considering the low level of the horizontal component of this vibration.

The increased stability of the working plate 1 accounts for a superior operating stability of the device according to the invention.

The vertical arrangement of the working plate 1 provides easy access to any element 5 incorporated in the optical circuit.

The arrangement of the connecting members 3 in the upper part of the working plate 1 accounts for a low position of the centre of gravity of the plate 1 in relation to the point of support. This results in rapid damping of vibration of the working plate 1 if the latter is accidentally touched.

The operating principle of the device of Fig. 2 is similar to that of the device of Fig. 1.

The former device differs from the latter in that its base 2 has four elastic members 9, which ensures more rapid damping of vibration of the working plate 1. The four elastic members 9 also make it possible to adjust the position of the plate 1 with respect to the vertical, for which purpose the degree of elasticity of the members 9 is appropriately controlled.

The arrangement of the light source 7 on the opposite side of the working plate 2 rules out exposure of the optical elements 5 to the heat radiation of the light source 7.

The operating principle of the device shown in Figs. 3 and 4 is similar to that of the device of Fig. 2.

The former device differs from the latter in that the working plate 1 (Figs. 3 and 4) is enclosed in the frame 10, which substantially increases the rigidity of the plate 1. The frame 10 and the movable screen 11 protect the optical circuit from the effects of air flows, temperature fluctuations and acoustic noise.

The operating principle of the device shown in Figs. 5 through 11 is similar to that of the device of Fig. 2. The operating principle of the device of Fig. 12 is similar to that of the device of Fig. 1.

Unlike conventional devices for optical research, the device according to the present invention considerably simplifies the design and reduces the weight of the working plate, increases its stability and effectively protects it from vibration. The device of this invention makes it possible to use several light sources without reducing the area intended for the optical circuit elements. The device of this invention effectively protects the optical circuit from the heat radiation of the light sources and from such adverse external factors as air flows, temperature fluctuations and acoustic noise. The device according to the invention provides for simultaneous use of two optical circuits. Finally, the device of this invention occupies little floor space, is easy to operate, and provides easy access to the elements of the optical circuit.

CLAIMS

1. A device for conducting optical research, comprising a working plate mounted on a vibration-proof base in a substantially vertical plane with the aid of connecting members arranged in the upper part of said working plate; holders of elements making up an optical circuit, mounted on the working plate; and at least one light source connected to the working plate.

2. A device as claimed in claim 1, wherein the working plate is enclosed in a frame.

3. A device as claimed in claim 2, wherein the upper part of the frame and connecting members form an integral bar.

4. A device as claimed in claim 2 or 3, which incorporates at least one screen movably mounted on the frame and intended to protect the optical circuit elements from the effects of air flows, temperature fluctuations and acoustic noise.

5. A device as claimed in any one of claims 2, 3 and 4, wherein at least one of the light sources is mounted on the upper part of the frame.

6. A device as claimed in any one of claims 1 to

5, wherein the holders of optical circuit elements are mounted on the opposite side of the working plate.

7. A device for conducting optical research, substantially as described above with reference to, and as shown, in the accompanying drawings.

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